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<110>   Famodu, Layo O.
        Orozco, Buddy
        Rafalski, Antoni

<120>   Plant Aminoacyl-tRNA Synthetase

<130>   BB-1191

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<150>   60/092,866
<151>   July 15, 1998

<160>   29

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<213>   Zea mays

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gcatcaatag ggctattccg accttccaa ttaaccttga agatgcggct cggagtgagg     660
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tcgtgccgta agtttctgat tccaagcctg agtcttgcag tggtctacgg agcagatccg   1740
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atcagagttc ctgttgaatt tcacaaaagc ctacttgttc ctaatagatt gctgcaacca   1860
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<210> 2
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<212> PRT
<213> Zea mays

<400> 2

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                20                  25                  30

Lys Asp Ala Arg Lys Ala Glu Lys Ala Glu Gln Arg Gln Arg Gln Gln
            35                  40                  45

Gln Gln Gln Gln Gln Pro Ala Asp Ala Glu Asp Pro Phe Ala Ala Asn
        50                  55                  60

Tyr Gly Glu Val Pro Val Glu Glu Ile Gln Ser Lys Ala Ile Ser Gly
65                  70                  75                  80

Arg Ser Trp Ser His Val Gly Asp Leu Asp Asp Ser Ala Ala Gly Arg
                85                  90                  95

Ser Val Leu Ile Arg Gly Ala Ala Gln Ala Ile Arg Pro Val Ser Lys
                100                 105                 110

Lys Met Ala Phe Val Val Leu Arg Gln Ser Met Ser Thr Val Gln Cys
            115                 120                 125

Val Leu Val Ala Ser Ala Asp Ala Gly Val Ser Thr Gln Met Val Arg
        130                 135                 140

Phe Ala Thr Ala Leu Ser Lys Glu Ser Ile Val Asp Val Glu Gly Val
145                 150                 155                 160

Val Ser Leu Pro Lys Glu Pro Leu Lys Ala Thr Thr Gln Gln Val Glu
                165                 170                 175

Ile Gln Val Arg Lys Ile Tyr Cys Ile Asn Arg Ala Ile Pro Thr Leu
                180                 185                 190

Pro Ile Asn Leu Glu Asp Ala Ala Arg Ser Glu Ala Asp Phe Glu Lys
        195                 200                 205

Ala Glu Leu Ala Gly Glu Lys Leu Val Arg Val Gly Gln Asp Thr Arg
210                 215                 220

Leu Asn Tyr Arg Ala Ile Asp Leu Arg Thr Pro Ser Asn Gln Ala Ile
225                 230                 235                 240

Phe Arg Ile Gln Cys Gln Val Glu Asn Lys Phe Arg Asp Phe Leu Leu
                245                 250                 255

Ser Lys Asn Phe Val Gly Ile His Thr Pro Lys Leu Ile Ser Gly Ser
            260                 265                 270

Ser Glu Gly Gly Ala Ala Val Phe Lys Leu Leu Tyr Asn Gly Gln Pro
        275                 280                 285
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2

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Ala Cys Leu Ala Gln Ser Pro Gln Leu Tyr Lys Gln Met Ala Ile Ser
    290                 295                 300

Gly Gly Phe Glu Arg Val Phe Glu Val Gly Pro Val Phe Arg Ala Glu
305                 310                 315                 320

Asn Ser Asn Thr His Arg His Leu Cys Glu Phe Val Gly Leu Asp Ala
                325                 330                 335

Glu Met Glu Ile Lys Glu His Tyr Phe Glu Val Cys Asp Ile Ile Asp
                340                 345                 350

Gly Leu Phe Val Ser Ile Phe Lys His Leu Ser Glu Asn Cys Lys Lys
            355                 360                 365

Glu Leu Glu Ser Ile Asn Arg Gln Tyr Pro Phe Glu Pro Leu Lys Tyr
    370                 375                 380

Leu Asp Lys Thr Phe Lys Leu Thr Tyr Glu Gly Gly Ile Gln Met Leu
385                 390                 395                 400

Lys Glu Ala Gly Thr Glu Ile Glu Pro Met Gly Asp Leu Asn Thr Glu
                405                 410                 415

Ala Glu Lys Lys Leu Gly Arg Leu Val Arg Glu Lys Tyr Asp Thr Asp
                420                 425                 430

Phe Phe Ile Leu Tyr Arg Tyr Pro Leu Ala Val Arg Pro Phe Tyr Thr
            435                 440                 445

Met Pro Cys Tyr Asp Asn Pro Ala Tyr Thr Asn Ser Phe Asp Val Phe
    450                 455                 460

Ile Arg Gly Glu Glu Ile Ile Ser Gly Ala Gln Arg Ile His Thr Pro
465                 470                 475                 480

Glu Leu Leu Ala Lys Arg Ala Thr Glu Cys Gly Ile Asp Val Ser Thr
                485                 490                 495

Ile Ser Ala Tyr Ile Glu Ser Phe Ser Tyr Gly Val Pro Pro His Gly
            500                 505                 510

Gly Phe Gly Val Gly Leu Glu Arg Val Val Met Leu Phe Cys Ala Leu
            515                 520                 525

Asn Asn Ile Arg Lys Thr Ser Leu Phe Pro Arg Asp Pro Gln Arg Leu
    530                 535                 540

Val Pro
545
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<211> 730
<212> DNA
<213> Oryza sativa

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aatcgaaccc atgggtgacc tcaacactga agctgagaaa aaactaggcc ggcttgttaa 120
ggagaagtat ggaacagaat ttttcatcct ctatcggtat cctttggctg tgcgtccctt 180

3

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tgcaacagag tgtggaattg atgcgagtac tatttcatca tatatcgaat cgttcagcta 360
tggtgcacct cctcatgtvg gtttggtgt cggcctggag agggtggtaa tgctgttctg 420
cgccctaaac aacatcagga agacatcact tttccctcgc gatccacaaa ggctggtgcc 480
ataatttgct ttttttccca agagcaaggt ttggactcag tacggactgg gcagttttcc 540
tcggctggtt tttttacctg gacattattt tcgtatttat taatgtgctg tactgcaaaa 600
gctgctcctt tccacaacat ttggaatagt tgccgataca tttggaatag ggctcaacgt 660
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aaaaaaaaaa                                                        730


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<212>    PRT
<213>    Oryza sativa

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Met Leu Lys Glu Ala Gly Thr Glu Ile Glu Pro Met Gly Asp Leu Asn
  1               5                  10                  15

Thr Glu Ala Glu Lys Lys Leu Gly Arg Leu Val Lys Glu Lys Tyr Gly
             20                  25                  30

Thr Glu Phe Phe Ile Leu Tyr Arg Tyr Pro Leu Ala Val Arg Pro Phe
         35                  40                  45

Tyr Thr Met Pro Cys Tyr Asp Asn Pro Ala Tyr Ser Asn Ser Phe Asp
     50                  55                  60

Val Phe Ile Arg Gly Glu Glu Ile Ile Ser Gly Ala Gln Arg Ile His
 65                  70                  75                  80

Leu Pro Glu Leu Leu Thr Lys Arg Ala Thr Glu Cys Gly Ile Asp Ala
             85                  90                  95

Ser Thr Ile Ser Ser Tyr Ile Glu Ser Phe Ser Tyr Gly Ala Pro Pro
            100                 105                 110

His Gly Gly Phe Gly Val Gly Leu Glu Arg Val Val Met Leu Phe Cys
            115                 120                 125

Ala Leu Asn Asn Ile Arg Lys Thr Ser Leu Phe Pro Arg Asp Pro Gln
            130                 135                 140

Arg Leu Val Pro
145


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<212>    DNA
<213>    Glycine max

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tgtcgaaggc gttgtttcga tccctccgc tcccatcaaa ggcgccacac aacaggtgga  180
aattcaagtg aggaagttgt attgtgtcag tagggcgta cctactctgc ctattaatct  240
tgaggatgct gctcgaagtg aagttgaaat cgagacggct cttcaggctg gtgagcaact  300
tgttcgtgtt aatcaggata cacgtctgaa ctttagggtg cttgatgtgc gaacgccagc  360
taatcaaggg attttccgca ttcagtctca agttggaaat gcgtttagac aattcttatt  420
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4

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gcttcacaag caaatgtcta tttgtggaga ttttggccgt gtttttgaga ttggtcctgt   600
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cgcaatgttt gacagtttga accagaattg taagaaggat ctggaagctg tcgggtctca   780
gtatccattt gaacctttga agtatctgcg gacgacacta cggcttacat atgaagaagg   840
gattcagatg ctcaaggatg ttggagtaga aattgaacct tatggtgact tgaatactga   900
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tcaccggtac cctttggctg taaggccatt ctatacaatg ccttgctacg acaatcctgc  1020
atacagcaac tcgtttgatg tctttattcg aggtgaggag ataatttcag gagctcagcg  1080
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<212>   PRT
<213>   Glycine max

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Ala Gln Ala Asp Thr Val Ser Pro Gln Met Val Lys Phe Ala Ala Ala
             20                  25                  30

Leu Ser Arg Glu Ser Ile Val Asp Val Glu Gly Val Val Ser Ile Pro
         35                  40                  45

Ser Ala Pro Ile Lys Gly Ala Thr Gln Gln Val Glu Ile Gln Val Arg
     50                  55                  60

Lys Leu Tyr Cys Val Ser Arg Ala Val Pro Thr Leu Pro Ile Asn Leu
 65                  70                  75                  80

Glu Asp Ala Ala Arg Ser Glu Val Glu Ile Glu Thr Ala Leu Gln Ala
                 85                  90                  95

Gly Glu Gln Leu Val Arg Val Asn Gln Asp Thr Arg Leu Asn Phe Arg
            100                 105                 110

Val Leu Asp Val Arg Thr Pro Ala Asn Gln Gly Ile Phe Arg Ile Gln
         115                 120                 125

Ser Gln Val Gly Asn Ala Phe Arg Gln Phe Leu Leu Ser Glu Gly Phe
 130                 135                 140

Cys Glu Ile His Thr Pro Lys Leu Ile Ala Gly Ser Ser Glu Gly Gly
145                 150                 155                 160

Ala Ala Val Phe Arg Leu Asp Tyr Lys Gly Gln Pro Ala Cys Leu Ala
                 165                 170                 175

Gln Ser Pro Gln Leu His Lys Gln Met Ser Ile Cys Gly Asp Phe Gly
             180                 185                 190

Arg Val Phe Glu Ile Gly Pro Val Phe Arg Ala Glu Asp Ser Tyr Thr
         195                 200                 205

His Arg His Leu Cys Glu Phe Thr Gly Leu Asp Val Glu Met Glu Ile
     210                 215                 220
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5

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Lys Lys His Tyr Phe Glu Val Met Asp Ile Val Asp Arg Leu Phe Val
225                 230                 235                 240

Ala Met Phe Asp Ser Leu Asn Gln Asn Cys Lys Lys Asp Leu Glu Ala
                245                 250                 255

Val Gly Ser Gln Tyr Pro Phe Glu Pro Leu Lys Tyr Leu Arg Thr Thr
                260                 265                 270

Leu Arg Leu Thr Tyr Glu Glu Gly Ile Gln Met Leu Lys Asp Val Gly
        275                 280                 285

Val Glu Ile Glu Pro Tyr Gly Asp Leu Asn Thr Glu Ala Glu Arg Lys
        290                 295                 300

Leu Gly Gln Leu Val Ser Glu Lys Tyr Gly Thr Glu Phe Tyr Ile Leu
305                 310                 315                 320

His Arg Tyr Pro Leu Ala Val Arg Pro Phe Tyr Thr Met Pro Cys Tyr
            , 325 ,              330 ,               335

Asp Asn Pro Ala Tyr Ser Asn Ser Phe Asp Val Phe Ile Arg Gly Glu
            340                 345                 350

Glu Ile Ile Ser Gly Ala Gln Arg Val His Val Pro Glu Phe Leu Glu
            355                 360                 365

Gln


<210>  7
<211>  836
<212>  DNA
<213>  Triticum aestivum

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tgcttattta gcgcagtctc tacaatcata caagcaaatg agcatctgtg gtggctttgg   180
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tgatatcata gattgctaat tgtagcaata ttcaaacacc caaatgaaaa ttgtcagaag   360
gaactcgaga caataaatag gcagtatcca tttgaacctc tgaagtacct agagaaaacg   420
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gctgttgctg gtcgttttcc tttttacttt tgcactttgg ccgtcataaa cgatacatgc   660
ttgctccctg gatggatctc tttctctccc tggatctttt aaacaggtgt tgtgattaaa   720
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aatctcgagg gggggcccgg tactgttcac cgcgtggcgc cgggctagag actagt       836

<210>  8
<211>  98
<212>  PRT
<213>  Triticum aestivum

<400>  8
Val Phe Val Leu Gly Leu Gly Ile His Ser Pro Lys Leu Ile Gly Gly
  1                 5                  10                 15
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Ser Ser Glu Leu Gly Ala Ser Pro Phe Lys Leu Ala Tyr Asn Tyr Gln
             20                  25                  30

Pro Ala Tyr Leu Ala Gln Ser Leu Gln Ser Tyr Lys Gln Met Ser Ile
          35                  40                  45

Cys Gly Gly Phe Gly Arg Val Phe Glu Ala Gly Pro Val Phe Arg Ser
      50                  55                  60

Glu Lys Ser Asn Thr His Arg His Leu Cys Glu Phe Ile Gly Leu Asp
 65                  70                  75                  80

Ala Glu Met Glu Ile Lys Glu His Tyr Phe Glu Val Cys Asp Ile Ile
                  85                  90                  95

Asp Cys


<210>   9
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<212>   DNA
<213>   Zea mays

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tttgcctgag ggcagttatc gcattttgaa gactaacaaa aatcgccatc tctggatgtg 1980
gtattcctaca gggtaggggt tccaggttga ctcaccagtt aaaacatgca tttctggttg 2040
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<211> 599
<212> PRT
<213> Zea mays

<400> 10

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            20                  25                  30

Leu Ala Arg Ala Thr Thr Met Ala Glu Glu Val Gln Ala Pro Leu Ser
        35                  40                  45

Ala Thr Met Ala Lys Glu Ala Gln Ser Pro Pro Ser Ala Thr Ile Ala
    50                  55                  60

Glu Ala Thr Ala Pro Pro Gln Leu Leu Leu Phe Asn Ser Phe Thr Lys
65          ,     .70                  75                  80

Arg Glu Glu Pro Phe Gln Pro Arg Val Glu Gly Lys Val Gly Met Tyr
                85                  90                  95

Val Cys Gly Val Thr Pro Tyr Asp Phe Ser His Ile Gly His Ala Arg
            100                 105                 110

Ala Tyr Val Ala Phe Asp Val Leu Tyr Arg Tyr Leu Lys Phe Leu Gly
        115                 120                 125

Tyr Glu Val Glu Tyr Val Arg Asn Phe Thr Asp Ile Asp Asp Lys Ile
    130                 135                 140

Ile Lys Arg Ala Asn Glu Arg Gly Glu Thr Val Thr Ser Leu Ser Ser
145                 150                 155                 160

Gln Phe Ile Asn Glu Phe Leu Leu Asp Met Thr Glu Leu Gln Cys Leu
                165                 170                 175

Pro Pro Thr Cys Glu Pro Arg Val Thr Glu His Ile Glu His Ile Ile
            180                 185                 190

Lys Leu Ile Thr Gln Ile Met Glu Asn Gly Lys Ala Tyr Ala Ile Glu
        195                 200                 205

Gly Asp Val Tyr Phe Ser Val Glu Ser Phe Pro Glu Tyr Leu Ser Leu
    210                 215                 220

Ser Gly Arg Lys Phe Asp Gln Asn Gln Ala Gly Ala Arg Val Ala Phe
225                 230                 235                 240

Asp Thr Arg Lys Arg Asn Pro Ala Asp Phe Ala Leu Trp Lys Ala Ala
                245                 250                 255

Lys Glu Gly Glu Pro Phe Trp Asp Ser Pro Trp Gly Arg Gly Arg Pro
            260                 265                 270

Gly Trp His Ile Glu Cys Ser Ala Met Ser Ala His Tyr Leu Gly His
        275                 280                 285
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8

Val Phe Asp Ile His Gly Gly Gly Lys Asp Leu Ile Phe Pro His His
290   295   300

Glu Asn Glu Leu Ala Gln Ser Arg Ala Ala Tyr Pro Asp Ser Glu Val
305   310   315   320

Lys Cys Trp Met His Asn Gly Phe Val Asn Lys Asp Asp Lys Lys Met
325   330   335

Ala Lys Ser Asp Asn Asn Phe Phe Thr Ile Arg Asp Ile Ile Ala Leu
340   345   350

Tyr His Pro Met Ala Leu Arg Phe Phe Leu Met Arg Thr His Tyr Arg
355   360   365

Ser Asp Val Asn His Ser Asp Gln Ala Leu Glu Ile Ala Ser Asp Arg
370   375   380

Val Tyr Tyr Ile Tyr Gln Thr Leu Tyr Asp Cys Glu Glu Val Leu Ala
385   ,   390   395   400

Thr Tyr Arg Glu Glu Gly Thr Ser Leu Pro Val Pro Ser Glu Glu Gln
405   410   415

Asn Leu Ile Gly Lys His His Ser Glu Phe Leu Lys His Met Ser Asn
420   425   430

Asp Leu Lys Thr Thr Asp Val Asn Asp Arg Cys Phe Met Glu Leu Leu
435   440   445

Lys Ala Ile Asn Ser Ser Leu Asn Asp Leu Lys Lys Leu Gln Gln Lys
450   455   460

Ile Glu Gln Gln Lys Lys Lys Gln Gln Gln Gln Lys Lys Gln Gln Gln
465   470   475   480

Gln Lys Gln Gln Gln Gln Gln Lys Gln Gln Leu Gln Lys Gln Pro Glu
485   490   495

Asp Tyr Ile Gln Ala Leu Ile Ala Leu Glu Thr Glu Leu Lys Asn Lys
500   505   510

Leu Ser Ile Leu Gly Leu Met Pro Ser Ser Ser Leu Ala Glu Val Leu
515   520   525

Lys Gln Leu Lys Asp Lys Ser Leu Lys Arg Ala Gly Leu Thr Glu Glu
530   535   540

Gln Leu Gln Glu Gln Ile Glu Gln Arg Asn Val Ala Arg Lys Asn Lys
545   550   555   560

Gln Phe Glu Ile Ser Asp Gly Ile Arg Lys Asn Leu Ala Thr Lys Gly
565   570   575

Ile Ala Leu Met Asp Glu Pro Ser Gly Thr Val Trp Arg Pro Cys Glu
580   585   590

Pro Glu Arg Ser Glu Glu Ser
595

9

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<210>  11
<211>  1957
<212>  DNA
<213>  Oryza sativa

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<212>  PRT
<213>  Oryza sativa

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            20                  25                  30

Leu Phe Asn Ser Met Thr Lys Lys Lys Glu Leu Phe Glu Pro Leu Val
        35                  40                  45

Glu Gly Lys Val Arg Met Tyr Val Cys Gly Val Thr Pro Tyr Asp Phe
    50                  55                  60
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10

Ser His Ile Gly His Ala Arg Ala Tyr Val Ala Phe Asp Val Leu Tyr
 65   70   75   80

Arg Tyr Leu Lys Phe Leu Gly Tyr Glu Val Glu Tyr Val Arg Asn Phe
                 85   90   95

Thr Asp Ile Asp Asp Lys Ile Ile Lys Arg Ala Asn Glu Ala Gly Glu
             100   105   110

Thr Val Thr Ser Leu Ser Ser Arg Phe Ile Asn Glu Phe Leu Leu Asp
         115   120   125

Met Ala Gln Leu Gln Cys Leu Pro Pro Thr Cys Glu Pro Arg Val Thr
     130   135   140

Asp His Ile Glu His Ile Ile Glu Leu Ile Thr Lys Ile Met Glu Asn
145   150   155   160

Gly Lys Ala Tyr Ala Met Glu Gly Asp Val Tyr Phe Ser Val Asp Thr
             165   170   175

Phe Pro Glu Tyr Leu Ser Leu Ser Gly Arg Lys Leu Asp His Asn Leu
         180   185   190

Ala Gly Ser Arg Val Ala Val Asp Thr Arg Lys Arg Asn Pro Ala Asp
         195   200   205

Phe Ala Leu Trp Lys Ala Ala Lys Glu Gly Glu Pro Phe Trp Asp Ser
     210   215   220

Pro Trp Gly Arg Gly Arg Pro Gly Trp His Ile Glu Cys Ser Ala Met
225   230   235   240

Ser Ala His Tyr Leu Gly His Val Phe Asp Ile His Gly Gly Gly Lys
             245   250   255

Asp Leu Ile Phe Pro His His Glu Asn Glu Leu Ala Gln Ser Arg Ala
         260   265   270

Ala Tyr Pro Glu Ser Glu Val Lys Cys Trp Met His Ser Asn Gly Phe Val
         275   280   285

Asn Lys Asp Asp Gln Lys Met Ser Lys Ser Asp Lys Asn Phe Phe Thr
         290   295   300

Ile Arg Asp Ile Ile Asp Leu Tyr His Pro Met Ala Leu Arg Phe Phe
305   310   315   320

Leu Met Arg Thr His Tyr Arg Gly Asp Val Asn His Ser Asp Lys Ala
             325   330   335

Leu Glu Ile Ala Ser Asp Arg Val Tyr Tyr Ile Tyr Gln Thr Leu Tyr
             340   345   350

Asp Cys Glu Glu Val Leu Ser Gln Tyr Arg Gly Glu Asn Ile Ser Val
         355   360   365

Pro Val Pro Val Glu Glu Gln Asp Met Val Asn Lys His His Ser Glu
         370   375   380

                                    11

Phe Leu Glu Ser Met Ala Asp Asp Leu Arg Thr Thr Asp Val Leu Asp
385   390   395   400

Gly Phe Thr Asp Leu Leu Lys Ala Ile Asn Ser Asn Leu Asn Asp Phe
                405   410   415

Lys Lys Leu Gln Gln Lys Leu Glu Gln Gln Lys Lys Lys Gln Gln Gln
            420   425   430

Gln Lys Gln Gln Lys Gln Lys Gln Gln Ala Gln Lys Gln Pro Glu
        435   440   445

Glu Tyr Ile Gln Ala Met Phe Ala Leu Glu Thr Glu Ile Lys Asn Lys
        450   455   460

Ile Ser Ile Leu Gly Leu Met Pro Pro Ser Ser Leu Ala Glu Ala Leu
465   470   475   480

Lys Gln Leu Lys Asp Lys Ala Leu Lys Arg Ala Gly Leu Thr Glu
                485   ,   490   495

Leu Leu Gln Glu Gln Ile Glu Gln Arg Thr Ala Ala Arg Lys Asn Lys
            500   505   510

Gln Phe Asp Val Ser Asp Gln Ile Arg Lys Gln Leu Gly Ser Lys Gly
        515   520   525

Ile Ala Leu Met Asp Glu Pro Thr Gly Thr Val Trp Arg Pro Cys Glu
        530   535   540

Pro Glu Ser Glu
545

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actccgctcc acccagactc cacgccgcca tcttcaggag caaaaacttt tcttttttgcg   180
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<212>  PRT
<213>  Glycine, max


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Lys Met Gly Thr Val Ser Leu Leu Lys Cys Tyr Arg Pro Phe Phe Ser
             20                  25                  30

Met Leu Phe Pro His Ser Ala Pro Pro Arg Leu His Ala Ala Ile Phe
         35                  40                  45

Arg Ser Lys Asn Phe Ser Phe Cys Ala Thr Ser Ser Pro Pro Leu Thr
     50                  55                  60

Ala Glu Lys Gly Cys Gly Lys Ser Asp Ala Glu Cys Pro Thr Leu Pro
 65                  70                  75                  80

Glu Val Trp Leu His Asn Thr Met Ser Arg Thr Lys Glu Leu Phe Lys
                 85                  90                  95

Pro Lys Val Glu Ser Lys Val Gly Met Tyr Val Cys Gly Val Thr Ala
             100                 105                 110

Tyr Asp Leu Ser His Ile Gly His Ala Arg Val Tyr Val Asn Phe Asp
             115                 120                 125

Leu Leu Tyr Arg Tyr Phe Lys His Leu Gly Phe Glu Val Cys Tyr Val
     130                 135                 140

Arg Asn Phe Thr Asp Val Asp Asp Lys Ile Ile Ala Arg Ala Lys Glu
145                 150                 155                 160

Leu Gly Glu Asp Pro Ile Ser Leu Ser Trp Arg Tyr Cys Glu Glu Phe
                 165                 170                 175

Cys Gln Asp Met Val Thr Leu Asn Cys Leu Ser Pro Ser Val Glu Pro
             180                 185                 190
```

13

```
Lys Val Ser Glu His Met Pro Gln Ile Ile Asp Met Ile Glu Lys Ile
        195                 200                 205

Leu Asn Asn Gly Tyr Ala Tyr Ile Val Asp Gly Asp Val Tyr Phe Asn
        210                 215                 220

Val Glu Lys Phe Pro Glu Tyr Gly Lys Leu Ser Ser Arg Asp Leu Glu
225                 230                 235                 240

Asp Asn Arg Ala Gly Glu Arg Val Ala Val Asp Ser Arg Lys Lys Asn
        245                 250                 255

Pro Ala Asp Phe Ala Leu Trp Lys Ser Ala Lys Pro Gly Glu Pro Phe
        260                 265                 270

Trp Glu Ser Pro Trp Gly Gly Arg Pro Gly Trp His Ile Glu Cys
        275                 280                 285

Ser Ala Met Ser Ala Ala Tyr Leu Gly Tyr Ser Phe Asp Ile His Gly
        290                 295                 300

Gly Gly Ile Asp Leu Val Phe Pro His His Glu Asn Glu Ile Ala Gln
305                 310                 315                 320

Ser Cys Ala Ala Cys Lys Lys Ser Asp Ile Ser Ile Trp Met His Asn
                325                 330                 335

Gly Phe Val Thr Ile Asp Ser Val Lys Met Ser Lys Ser Leu Gly Asn
                340                 345                 350

Phe Phe Thr Ile Arg Gln Val Ile Asp Val Tyr His Pro Leu Ala Leu
        355                 360                 365

Arg Tyr Phe Leu Met Ser Ala His Tyr Arg Ser Pro Ile Asn Tyr Ser
        370                 375                 380

Asn Ile Gln Leu Glu Ser Ala Ser Asp Arg Val Phe Tyr Ile Tyr Glu
385                 390                 395                 400

Thr Leu His Glu Cys Glu Ser Phe Leu Asn Gln His Asp Gln Arg Lys
                405                 410                 415

Asp Ser Thr Pro Pro Asp Thr Leu Asp Ile Ile Asp Lys Phe His Asp
        420                 425                 430

Val Phe Leu Thr Ser Met Ser Asp Asp Leu His Thr Pro Val Val Leu
        435                 440                 445

Ala Gly Met Ser Asp Pro Leu Lys Ser Ile Asn Asp Leu Leu His Ala
        450                 455                 460

Arg Lys Gly Lys Lys Gln Gln Phe Arg Ile Glu Ser Leu Ser Ala Leu
465                 470                 475                 480

Glu Lys Ser Val Arg Asp Val Leu Thr Val Leu Gly Leu Met Pro Ala
                485                 490                 495

Ser Tyr Ser Glu Val Leu Gln Gln Leu Lys Val Lys Ala Leu Lys Arg
        500                 505                 510
```

14

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Ala Asn Phe Thr Glu Glu Glu Val Leu Gln Lys Ile Glu Glu Arg Ala
        515                 520                 525

Thr Ala Arg Met Gln Lys Glu Tyr Ala Lys Ser Asp Ala Ile Arg Lys
    530                 535                 540

Asp Leu Ala Val Leu Gly Ile Thr Leu Met Asp Ser Pro Asn Gly Thr
545                 550                 555                 560

Thr Trp Arg Pro Ala Ile Pro Leu Pro Leu Gln Glu Leu Leu
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<211>  633
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<213>  Zea mays

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cacgtcctcc accgtccgce gcacttcgcg tacacctgct taaggagtgg cgttggtgcc  180
cgaggaggag tgctcgcttc tggcatccac ccactccgtc gtctcaattg cagcgcggtt  240
gaagccgttc ccggccccac cgaggaggcg cctgctcctc aggcaaggaa gaaaagagta  300
gtttctggtg tacagccaac aggatcggtt caccttggaa attatctagg ggcaattaag  360
aattgggttg cacttcagga ttcatatgag acattctttt tcatcgtgga tcttcatgca  420
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tatcttgcat gtggcgtcga cagctccaag gcttctatct ttgtacagtc tcatgtccgt  540
gctcatgttg agttgatgtg gctattgagt tcttctactc ctattggctg gctgaataga  600
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```
<210>  16
<211>  410
<212>  PRT
<213>  Zea mays

<400>  16
His Gly Asp Asp Ala Met Ser Arg Ala Leu Leu Ser His Val Leu His
  1                 5                  10                  15

Arg Pro Pro His Phe Ala Tyr Thr Cys Leu Arg Ser Gly Val Gly Ala
                20                  25                  30

Arg Gly Gly Val Leu Ala Ser Gly Ile His Pro Leu Arg Arg Leu Asn
            35                  40                  45

Cys Ser Ala Val Glu Ala Val Pro Gly Pro Thr Glu Glu Ala Pro Ala
    50                  55                  60

Pro Gln Ala Arg Lys Lys Arg Val Val Ser Gly Val Gln Pro Thr Gly
65                  70                  75                  80

Ser Val His Leu Gly Asn Tyr Leu Gly Ala Ile Lys Asn Trp Val Ala
                85                  90                  95

Leu Gln Asp Ser Tyr Glu Thr Phe Phe Phe Ile Val Asp Leu His Ala
                100                 105                 110

Ile Thr Leu Pro Tyr Glu Ala Pro Leu Leu Ser Lys Ala Thr Arg Ser
        115                 120                 125
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15

```
Thr Ala Ala Ile Tyr Leu Ala Cys Gly Val Asp Ser Ser Lys Ala Ser
    130                 135                 140

Ile Phe Val Gln Ser His Val Arg Ala His Val Glu Leu Met Trp Leu
145                 150                 155                 160

Leu Ser Ser Ser Thr Pro Ile Gly Trp Leu Asn Arg Met Ile Gln Phe
                165                 170                 175

Lys Glu Lys Ser Arg Lys Ala Gly Asp Glu Asn Val Gly Val Ala Leu
                180                 185                 190

Leu Thr Tyr Pro Val Leu Met Ala Ser Asp Ile Leu Leu Tyr Gln Ser
        195                 200                 205

Asp Leu Val Pro Val Gly Glu Asp Gln Thr Gln His Leu Glu Leu Thr
    210                 215                 220

Arg Glu Ile Ala Glu Arg Val Asn Asn Leu Tyr Gly Gly Arg Lys Trp
225                 230                 235                 240

Lys Lys Leu Gly Gly Arg Gly Gly Leu Leu Phe Lys Val Pro Glu Ala
                245                 250                 255

Leu Ile Pro Pro Ala Gly Ala Arg Val Met Ser Leu Thr Asp Gly Leu
            260                 265                 270

Ser Lys Met Ser Lys Ser Ala Pro Ser Asp Gln Ser Arg Ile Asn Leu
        275                 280                 285

Leu Asp Pro Lys Asp Val Ile Ala Asn Lys Ile Lys Arg Cys Lys Thr
    290                 295                 300

Asp Ser Phe Pro Gly Met Glu Phe Asp Asn Pro Glu Arg Pro Glu Cys
305                 310                 315                 320

Arg Asn Leu Leu Ser Ile Tyr Gln Ile Ile Thr Glu Lys Thr Lys Glu
                325                 330                 335

Glu Val Val Ser Glu Cys Gln His Met Asn Trp Gly Thr Phe Lys Thr
            340                 345                 350

Thr Leu Thr Glu Ala Leu Ile Asp His Leu Gln Pro Ile Gln Val Arg
        355                 360                 365

Tyr Glu Glu Ile Met Ser Asp Pro Ala Tyr Leu Asp Asn Val Leu Leu
    370                 375                 380

Glu Gly Ala Val Lys Ala Ala Glu Ile Ala Asp Ile Thr Leu Asn Asn
385                 390                 395                 400

Val Tyr Gln Ala Met Gly Phe Leu Arg Arg
                405                 410
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16

<400> 17
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ctcactgcta cttcttcaga gactcccact ccaaccttcg tgaagaaacg agtagtgtcg   180
ggggttcagc ccacgggctc aattcacctc ggaaactatt ttggcgccat caagaattgg   240
gttgcccttc agaatgtgta tgatacactt ttcttcattg tggacctgca cgcgattaca   300
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aaggttccag agccccttat acctccagcc ggagcccgga taatgtccct aactgatggc   780
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cctctcttaa cagatgcctt gattgatcat ttgcatccca ttcaggttcg ctatgaggaa  1080
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gctttgtatc tccttcattt ttctccgagt atggtcgttg ccttcatttt atatttatt   1440
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<211> 400
<212> PRT
<213> Glycine max

<400> 18
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             20                  25                  30

Ser Arg Ile Arg Cys Cys Thr Thr Leu Thr Ala Thr Ser Ser Glu Thr
         35                  40                  45

Pro Thr Pro Thr Phe Val Lys Lys Arg Val Val Ser Gly Val Gln Pro
     50                  55                  60

Thr Gly Ser Ile His Leu Gly Asn Tyr Phe Gly Ala Ile Lys Asn Trp
 65                  70                  75                  80

Val Ala Leu Gln Asn Val Tyr Asp Thr Leu Phe Phe Ile Val Asp Leu
                 85                  90                  95

His Ala Ile Thr Leu Pro Tyr Asp Thr Gln Gln Leu Ser Lys Ala Thr
                100                 105                 110

Arg Ser Thr Ala Ala Ile Tyr Leu Ala Cys Gly Val Asp Pro Ser Lys
         115                 120                 125

Ala Ser Val Phe Val Gln Ser His Val Arg Ala His Val Glu Leu Met
     130                 135                 140
```

```
Trp Leu Leu Ser Ser Thr Thr Pro Ile Gly Trp Leu Asn Lys Met Ile
145                 150                 155                 160

Gln Phe Lys Glu Lys Ser Arg Lys Ala Gly Asp Glu Glu Val Gly Val
                165                 170                 175

Ala Leu Leu Thr Tyr Pro Val Leu Met Ala Ser Asp Ile Leu Leu Tyr
            180                 185                 190

Gln Ser Asp Phe Val Pro Val Gly Glu Asp Gln Lys Gln His Leu Glu
        195                 200                 205

Leu Thr Arg Asp Leu Ala Glu Arg Val Asn Asn Leu Tyr Gly Gly Arg
    210                 215                 220

Lys Trp Lys Lys Leu Gly Gly Tyr Asp Ser Arg Gly Gly Thr Ile Phe
225                 230                 235                 240

Lys Val Pro Glu Pro Leu Ile Pro Pro Ala Gly Ala Arg Ile Met Ser
              , 245 ,              250 ,              255

Leu Thr Asp Gly Leu Ser Lys Met Ser Lys Ser Ala Pro Ser Asp Gln
            260                 265                 270

Ser Arg Ile Asn Ile Leu Asp Pro Lys Asp Leu Ile Ala Asn Lys Ile
        275                 280                 285

Lys Arg Cys Lys Thr Asp Ser Phe Pro Gly Leu Glu Phe Asp Asn Ser
    290                 295                 300

Glu Arg Pro Glu Cys Asn Asn Leu Val Ser Ile Tyr Gln Leu Ile Ser
305                 310                 315                 320

Gly Lys Thr Lys Glu Glu Val Val Gln Glu Cys Gln Asn Met Asn Trp
                325                 330                 335

Gly Thr Phe Lys Pro Leu Leu Thr Asp Ala Leu Ile Asp His Leu His
            340                 345                 350

Pro Ile Gln Val Arg Tyr Glu Glu Ile Met Ser Asp Ser Gly Tyr Leu
        355                 360                 365

Asp Gly Val Leu Ala Gln Gly Ala Arg Asn Ala Ala Asp Ile Ala Asp
    370                 375                 380

Ser Thr Leu Asn Asn Ile Tyr Gln Ala Met Gly Phe Phe Lys Arg Gln
385                 390                 395                 400

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<213>   Triticum aestivum

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aaacgctgca aaactgactc gctccctggc ttggaattcg acaacccaga gaggccggaa  240
tgcaaaaatc ttctctcagt ctaccagatc atcactggaa aaacgaaaga ggaagttgtt  300
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18

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agtgaatgcc aagatatgaa ctgggggacg ttcaaggtta cccttacgga tgccttaatt 360
gatcatctgc aacctattca ggttcgatac gaggagatca tgtctgatcc aggttatttg 420
gacaatgttc tgctaaatgg ggcagggaaa gcttctgaga tagcagacgc caccctcaac 480
aacgtctacc aagccatggg tttcttgcgc agatagcata tgtagaacat tttttataac 540
tgcacaatgc tagtttttgca cttgttggcc tttctgctag tggtactgat aagcgttttg 600
tttgatatgc ttggattagc cttttgttcc tggttattat ggacactgtt aataggtatt 660
aaaaggatta tttactgaaa aaaaaaaaaa aaaaaaaaaa attaaaaggg ggcgcgcgta 720
ccata                                                             725
```

```
<210>  20
<211>  171
<212>  PRT
<213>  Triticum aestivum

<400>  20
Leu Val Pro Asn Ser Ala Arg Gly Gly Ser Leu Phe Lys Val Pro Glu
 1               5                  10                  15

Ala Leu Ile Pro Pro Ala Gly Ala Arg Val Met Ser Leu Thr Asp Gly
            20                  25                  30

Leu Ser Lys Met Ser Lys Ser Ala Pro Ser Asp Leu Ser Arg Ile Asn
        35                  40                  45

Leu Leu Asp Pro Asn Asp Val Ile Val Asn Lys Ile Lys Arg Cys Lys
    50                  55                  60

Thr Asp Ser Leu Pro Gly Leu Glu Phe Asp Asn Pro Glu Arg Pro Glu
65                  70                  75                  80

Cys Lys Asn Leu Leu Ser Val Tyr Gln Ile Ile Thr Gly Lys Thr Lys
                85                  90                  95

Glu Glu Val Val Ser Glu Cys Gln Asp Met Asn Trp Gly Thr Phe Lys
            100                 105                 110

Val Thr Leu Thr Asp Ala Leu Ile Asp His Leu Gln Pro Ile Gln Val
        115                 120                 125

Arg Tyr Glu Glu Ile Met Ser Asp Pro Gly Tyr Leu Asp Asn Val Leu
    130                 135                 140

Leu Asn Gly Ala Gly Lys Ala Ser Glu Ile Ala Asp Ala Thr Leu Asn
145                 150                 155                 160

Asn Val Tyr Gln Ala Met Gly Phe Leu Arg Arg
                165                 170
```

```
<210>  21
<211>  1062
<212>  DNA
<213>  Zea mays

<400>  21
gcacgaggga catcacgctg ctggatttcc tgagagaggt gggccgtttt gcacgcgtgg   60
gtacaatgat cgccaaggag agcgtcaaga agcgtcttgc gtcggaagac gggatgagct  120
acaccgagtt tacctaccag ctgctgcagg gctacgactt cctttacatg ttcaagaata  180
tgggtgtcaa tgtgcagatc ggggggcagcg atcagtgggg gaacatcaca gcgggaactg  240
agttgatcga aaaaatcttg caggttgaag gggcgcatgg actcacattc ccacttctgt  300
tgaagagcga cggtaccaaa tttggaaaga cggaggatgg ggcaatctgg ctctcttcga  360
```

19

```
agatgctttc tccttacaag ttctatcagt acttctttgc ggtgccagac atcgatgtca   420
tcaggtttat gaagatcctg acgttcctga gcttggatga gattctggag ctagaagact   480
cgatgaagaa gcctggctat gtgccaaaca ctgttcagaa gaggcttgca gaagaggtga   540
cgcgatttgt tcatggcgag gagggattgg aggaggcatt gaaggcaacc gaggccttga   600
gacctggtgc tcagacacaa ttggatgcac aaacaattga gggatagca gatgatgtgc   660
cttcatgctc tttagcttat gatcaagtgt tcaagtctcc acttattgat ttggctgttt   720
ccacaggttt gctcactagt aagtcagcag ttaagcggct tattaagcaa ggtggtctgt   780
acttgaataa cgtgaggatt gatagtgagg ataagctggt tgaggaaggt gatatagttg   840
atgggaaggt gctcttgttg tctgctggaa agaagaacaa gatggttgtg aggatatctt   900
gactactctt atttgttctt tataacttat tttagccatt gaggagaaaa gtaacggtgt   960
tgtgtcttca aaactcaaat gagctgtcta tgagcataca gattgttata ttggagaggt 1020
tgaacacacc tttttttttg ctctaaaaaa aaaaaaaaa aa                       1062

<210>  22
<211>  299
<212>  PRT
<213>  Zea mays

<400>  22
Thr Arg Asp Ile Thr Leu Leu Asp Phe Leu Arg Glu Val Gly Arg Phe
 1               5              10                  15

Ala Arg Val Gly Thr Met Ile Ala Lys Glu Ser Val Lys Lys Arg Leu
            20                  25                  30

Ala Ser Glu Asp Gly Met Ser Tyr Thr Glu Phe Thr Tyr Gln Leu Leu
        35                  40                  45

Gln Gly Tyr Asp Phe Leu Tyr Met Phe Lys Asn Met Gly Val Asn Val
    50                  55                  60

Gln Ile Gly Gly Ser Asp Gln Trp Gly Asn Ile Thr Ala Gly Thr Glu
65                  70                  75                  80

Leu Ile Arg Lys Ile Leu Gln Val Glu Gly Ala His Gly Leu Thr Phe
                85                  90                  95

Pro Leu Leu Leu Lys Ser Asp Gly Thr Lys Phe Gly Lys Thr Glu Asp
            100                 105                 110

Gly Ala Ile Trp Leu Ser Ser Lys Met Leu Ser Pro Tyr Lys Phe Tyr
        115                 120                 125

Gln Tyr Phe Phe Ala Val Pro Asp Ile Asp Val Ile Arg Phe Met Lys
    130                 135                 140

Ile Leu Thr Phe Leu Ser Leu Asp Glu Ile Leu Glu Leu Glu Asp Ser
145                 150                 155                 160

Met Lys Lys Pro Gly Tyr Val Pro Asn Thr Val Gln Lys Arg Leu Ala
                165                 170                 175

Glu Glu Val Thr Arg Phe Val His Gly Glu Glu Gly Leu Glu Glu Ala
            180                 185                 190

Leu Lys Ala Thr Glu Ala Leu Arg Pro Gly Ala Gln Thr Gln Leu Asp
        195                 200                 205

Ala Gln Thr Ile Glu Gly Ile Ala Asp Asp Val Pro Ser Cys Ser Leu
    210                 215                 220
```

20

```
Ala Tyr Asp Gln Val Phe Lys Ser Pro Leu Ile Asp Leu Ala Val Ser
225                 230                 235                 240

Thr Gly Leu Leu Thr Ser Ser Ala Val Lys Arg Leu Ile Lys Gln
                245                 250                 255

Gly Gly Leu Tyr Leu Asn Asn Val Arg Ile Asp Ser Glu Asp Lys Leu
                260                 265                 270

Val Glu Glu Gly Asp Ile Val Asp Gly Lys Val Leu Leu Leu Ser Ala
        275                 280                 285

Gly Lys Lys Asn Lys Met Val Val Arg Ile Ser
    290                 295
```

```
<210>   23
<211>   346
<212>   PRT
<213>   Drosophila melanogaster

<400>   23
Met Val Asp Lys Val Ala Asn Gly Val Ser Lys Lys Gly Ala Lys Lys
  1                 5                  10                  15

Ala Lys Ala Ala Lys Lys Ala Lys Ala Asn Ala Ser Thr Ala Ala Ala
            20                  25                  30

Asn Asn Ser Gly Gly Asp Ser Ala Asp His Ala Ala Gly Arg Tyr Gly
            35                  40                  45

Ser Met Ser Lys Asp Lys Arg Ser Arg Asn Val Val Ser Ser Gly Val
        50                  55                  60

Gly Lys Gly Val Trp Val Arg Gly Arg Val His Thr Ser Arg Ala Lys
65                  70                  75                  80

Gly Lys Cys Arg Ser Ser Thr Val Cys Ala Val Gly Asp Val Ser Lys
            85                  90                  95

Met Val Lys Ala Gly Asn Lys Ser Asp Ala Lys Val Ala Val Ser Ser
            100                 105                 110

Lys Ser Cys Thr Ser Ser Val Val Ser Ala Lys Ala Asp Ala Ser Arg
            115                 120                 125

Asn Ala Asp Asp Ala Gly Asn Arg Val Asn Asp Thr Arg Asp Asn Arg
        130                 135                 140

Val Asp Arg Thr Ala Asn Ala Arg Ala Gly Val Cys Arg Arg Asp Thr
145                 150                 155                 160

Gly Thr His Thr Lys Ser Ala Ala Ser Gly Gly Ala Asn Val Thr Val
                165                 170                 175

Ser Tyr Lys Asp Ser Ala Tyr Ala Ser Tyr Lys Met Ala Ala Ala Asp
            180                 185                 190

Asp Lys Val Tyr Thr Val Gly Ala Val Arg Ala Asp Ser Asn Thr His
        195                 200                 205
```

21

```
Arg His Thr Val Gly Asp Met Ala Lys Tyr His Tyr His Val His Thr
    210                 215                 220

Gly Asn Thr Thr Ser Lys Gly Arg Asp Lys Tyr Ala Lys Ser Val Gly
225                 230                 235                 240

Tyr Lys Val Asp Ala Lys Ala Asp Gly Val Ala Met Arg Ala Gly Val
                245                 250                 255

Thr Gly Asp Asp Ser Thr Asn Lys Gly Arg Val Lys Ala Lys Tyr Asp
            260                 265                 270

Thr Asp Tyr Asp Lys Ala Arg Tyr Thr Met Asp Asn Asn Val Tyr Ser
        275                 280                 285

Asn Ser Tyr Asp Met Met Arg Gly Ser Gly Ala Arg His Asp Tyr Arg
    290                 295                 300

Ala Lys His His Gly Asp Thr Ser Lys Ala Ala Tyr Ser Arg Tyr Gly
305             ,       310                 315                 320

Cys His Ala Gly Gly Gly Gly Met Arg Val Val Met Tyr Gly Asp Asn
                325                 330                 335

Arg Lys Thr Ser Met Arg Asp Lys Arg Thr
            340                 345
```

<210> 24
<211> 501
<212> PRT
<213> Rattus norvegicus

<400> 24
```
Met Pro Ser Ala Asn Ala Ser Arg Lys Gly Gln Glu Lys Pro Arg Glu
  1                 5                  10                  15

Ile Val Asp Ala Ala Glu Asp Tyr Ala Glu Arg Tyr Gly Val Ser
                20                  25                  30

Ser Met Ile Gln Ser Gln Glu Lys Pro Asp Arg Val Leu Val Arg Val
            35                  40                  45

Lys Asp Leu Thr Val Gln Lys Ala Asp Glu Val Val Trp Val Arg Ala
    50                  55                  60

Arg Val His Thr Ser Arg Ala Lys Gly Lys Gln Cys Phe Leu Val Leu
65                  70                  75                  80

Arg Gln Gln Gln Phe Asn Val Gln Ala Leu Val Ala Val Gly Asp His
                85                  90                  95

Ala Ser Lys Gln Met Val Lys Phe Ala Ala Asn Ile Asn Lys Glu Ser
            100                 105                 110

Ile Ile Asp Val Glu Gly Ile Val Arg Lys Val Asn Gln Ile Gly
        115                 120                 125

Ser Cys Thr Gln Gln Asp Val Glu Leu His Val Gln Lys Ile Tyr Val
    130                 135                 140
```

```
Ile Ser Leu Ala Glu Pro Arg Leu Pro Leu Gln Leu Asp Asp Ala Ile
145                 150                 155                 160

Arg Pro Glu Val Glu Gly Glu Glu Asp Gly Arg Ala Thr Val Asn Gln
                165                 170                 175

Asp Thr Arg Leu Asp Asn Arg Ile Ile Asp Leu Arg Thr Ser Thr Ser
            180                 185                 190

Gln Ala Ile Phe His Leu Gln Ser Gly Ile Cys His Leu Phe Arg Glu
        195                 200                 205

Thr Leu Ile Asn Lys Gly Phe Val Glu Ile Gln Thr Pro Lys Ile Ile
    210                 215                 220

Ser Ala Ala Ser Glu Gly Gly Ala Asn Val Phe Thr Val Ser Tyr Phe
225                 230                 235                 240

Lys Ser Asn Ala Tyr Leu Ala Gln Ser Pro Gln Leu Tyr Lys Gln Met
              , 245 .              250    ,              255

Cys Ile Cys Ala Asp Phe Glu Lys Val Phe Cys Ile Gly Pro Val Phe
            260                 265                 270

Arg Ala Glu Asp Ser Asn Thr His Arg His Leu Thr Glu Phe Val Gly
        275                 280                 285

Leu Asp Ile Glu Met Ala Phe Asn Tyr His Tyr His Glu Val Val Glu
    290                 295                 300

Glu Ile Ala Asp Thr Leu Val Gln Ile Phe Lys Gly Leu Gln Glu Arg
305                 310                 315                 320

Phe Gln Thr Glu Ile Gln Thr Val Asn Lys Gln Phe Pro Cys Glu Pro
                325                 330                 335

Phe Lys Phe Leu Glu Pro Thr Leu Arg Leu Glu Tyr Cys Glu Ala Leu
            340                 345                 350

Ala Met Leu Arg Glu Ala Gly Val Glu Met Asp Asp Glu Glu Asp Leu
        355                 360                 365

Ser Thr Pro Asn Glu Lys Leu Leu Gly Arg Leu Val Lys Glu Lys Tyr
    370                 375                 380

Asp Thr Asp Phe Tyr Val Leu Asp Lys Tyr Pro Leu Ala Val Arg Pro
385                 390                 395                 400

Phe Tyr Thr Met Pro Asp Pro Arg Asn Pro Lys Gln Ser Asn Ser Tyr
            405                 410                 415

Asp Met Phe Met Arg Gly Glu Glu Ile Leu Ser Gly Ala Gln Arg Ile
        420                 425                 430

His Asp Pro Gln Leu Leu Thr Glu Arg Ala Leu His His Gly Ile Asp
    435                 440                 445

Leu Glu Lys Ile Lys Ala Tyr Ile Asp Ser Phe Arg Phe Gly Ala Pro
    450                 455                 460
```

23

```
Pro His Ala Gly Gly Gly Ile Gly Leu Glu Arg Val Thr Met Leu Phe
465                 470                 475                 480

Leu Gly Leu His Asn Val Arg Gln Thr Ser Met Phe Pro Arg Asp Pro
                485                 490                 495

Lys Arg Leu Thr Pro
                500


<210>  25
<211>  500
<212>  PRT
<213>  Homo sapiens


<400>  25
Met Pro Ser Ala Thr Gln Arg Lys Ser Gln Glu Lys Pro Arg Glu Ile
  1                 5                  10                  15

Met Asp Ala Ala Glu Asp Tyr Ala Lys Glu Arg Tyr Gly Ile Ser Ser
                20                  25                  30

Met Ile Gln Ser Gln Glu Lys Pro Asp Arg Val Leu Val Arg Val Arg
             35                  40                  45

Asp Leu Thr Ile Gln Lys Ala Asp Glu Val Val Trp Val Arg Ala Arg
         50                  55                  60

Val His Thr Ser Arg Ala Lys Gly Lys Gln Cys Phe Leu Val Leu Arg
 65                  70                  75                  80

Gln Gln Gln Phe Asn Val Gln Ala Leu Val Ala Val Gly Asp His Ala
                85                  90                  95

Ser Lys Gln Met Val Lys Phe Ala Ala Asn Ile Asn Lys Glu Ser Ile
               100                 105                 110

Val Asp Val Glu Gly Val Val Arg Lys Val Asn Gln Lys Ile Gly Ser
         115                 120                 125

Cys Thr Gln Gln Asp Val Glu Leu His Val Gln Lys Ile Tyr Val Ile
     130                 135                 140

Ser Leu Ala Glu Pro Arg Leu Pro Leu Gln Leu Asp Asp Ala Val Arg
145                 150                 155                 160

Pro Glu Gln Glu Gly Glu Glu Glu Gly Arg Ala Thr Val Asn Gln Asp
                165                 170                 175

Thr Arg Leu Asp Asn Arg Val Ile Asp Leu Arg Thr Ser Thr Ser Gln
             180                 185                 190

Ala Val Phe Arg Leu Gln Ser Gly Ile Cys His Leu Phe Arg Glu Thr
         195                 200                 205

Leu Ile Asn Lys Gly Phe Val Glu Ile Gln Thr Pro Lys Ile Ile Ser
     210                 215                 220

Ala Ala Ser Glu Gly Gly Ala Asn Val Phe Thr Val Ser Tyr Phe Lys
225                 230                 235                 240
```

                                   24

```
Asn Asn Ala Tyr Leu Ala Gln Ser Pro Gln Leu Tyr Lys Gln Met Cys
              245                 250                 255

Ile Cys Ala Asp Phe Glu Lys Val Phe Ser Ile Gly Pro Val Phe Arg
              260                 265                 270

Ala Glu Asp Ser Asn Thr His Arg His Leu Thr Glu Phe Val Gly Leu
              275                 280                 285

Asp Ile Glu Met Ala Phe Asn Tyr His Tyr His Glu Val Met Glu Glu
      290                 295                 300

Ile Ala Asp Thr Met Val Gln Ile Phe Lys Gly Leu Gln Glu Arg Phe
305                 310                 315                 320

Gln Thr Glu Ile Gln Thr Val Asn Lys Gln Phe Pro Cys Glu Pro Phe
              325                 330                 335

Lys Phe Leu Glu Pro Thr Leu Arg Leu Glu Tyr Cys Glu Ala Leu Ala
              340         ,       345         .       350

Met Leu Arg Glu Ala Gly Val Glu Met Gly Asp Glu Asp Asp Leu Ser
              355                 360                 365

Thr Pro Asn Glu Lys Leu Leu Gly His Leu Val Lys Glu Lys Tyr Asp
      370                 375                 380

Thr Asp Phe Tyr Ile Leu Asp Lys Tyr Pro Leu Ala Val Arg Pro Phe
385                 390                 395                 400

Tyr Thr Met Pro Asp Pro Arg Asn Pro Lys Gln Ser Lys Ser Tyr Asp
              405                 410                 415

Met Phe Met Arg Gly Glu Glu Ile Leu Ser Gly Ala Gln Arg Ile His
              420                 425                 430

Asp Pro Gln Leu Leu Thr Glu Arg Ala Leu His His Gly Asn Asp Leu
      435                 440                 445

Glu Lys Ile Lys Ala Tyr Ile Asp Ser Phe Arg Phe Gly Ala Pro Pro
      450                 455                 460

His Ala Gly Gly Gly Ile Gly Leu Glu Arg Val Thr Met Leu Phe Leu
465                 470                 475                 480

Gly Leu His Asn Val Arg Gln Thr Ser Met Phe Pro Arg Asp Pro Lys
              485                 490                 495

Arg Leu Thr Pro
              500

<210>   26
<211>   459
<212>   PRT
<213>   Haemophilus influenzae Rd

<400>   26
Met Leu Lys Ile Phe Asn Thr Leu Thr Arg Glu Lys Glu Ile Phe Lys
  1               5         .         10                  15
```
25

```
Pro Ile His Glu Asn Lys Val Gly Met Tyr Val Cys Gly Val Thr Val
          20                      25                      30

Tyr Asp Leu Cys His Ile Gly His Gly Arg Thr Phe Val Cys Phe Asp
          35                      40                      45

Val Ile Ala Arg Tyr Leu Arg Ser Leu Gly Tyr Asp Leu Thr Tyr Val
      50                      55                      60

Arg Asn Ile Thr Asp Val Asp Asp Lys Ile Ile Lys Arg Ala Leu Glu
65                      70                      75                  80

Asn Lys Glu Thr Cys Asp Gln Leu Val Asp Arg Met Val Gln Glu Met
                  85                      90                      95

Tyr Lys Asp Phe Asp Ala Leu Asn Val Leu Arg Pro Asp Phe Glu Pro
          100                     105                     110

Arg Ala Thr His His Ile Pro Glu Ile Ile Glu Ile Val Glu Lys Leu
      115         '       '   120             '       125

Ile Lys Arg Gly His Ala Tyr Val Ala Asp Asn Gly Asp Val Met Phe
      130                     135                     140

Asp Val Glu Ser Phe Lys Glu Tyr Gly Lys Leu Ser Arg Gln Asp Leu
145                     150                     155                 160

Glu Gln Leu Gln Ala Gly Ala Arg Ile Glu Ile Asn Glu Ile Lys Lys
                  165                     170                     175

Asn Pro Met Asp Phe Val Leu Trp Lys Met Ser Lys Glu Asn Glu Pro
                  180                     185                     190

Ser Trp Ala Ser Pro Trp Gly Ala Gly Arg Pro Gly Trp His Ile Glu
          195                     200                     205

Cys Ser Ala Met Asn Cys Lys Gln Leu Gly Glu Tyr Phe Asp Ile His
      210                     215                     220

Gly Gly Gly Ser Asp Leu Met Phe Pro His His Glu Asn Glu Ile Ala
225                     230                     235                 240

Gln Ser Cys Cys Ala His Gly Gly Gln Tyr Val Asn Tyr Trp Ile His
                  245                     250                     255

Ser Gly Met Ile Met Val Asp Lys Glu Lys Met Ser Lys Ser Leu Gly
          260                     265                     270

Asn Phe Phe Thr Ile Arg Asp Val Leu Asn His Tyr Asn Ala Glu Ala
          275                     280                     285

Val Arg Tyr Phe Leu Leu Thr Ala His Tyr Arg Ser Gln Leu Asn Tyr
      290                     295                     300

Ser Glu Glu Asn Leu Asn Leu Ala Gln Gly Ala Leu Glu Arg Leu Tyr
305                     310                     315                 320

Thr Ala Leu Arg Gly Thr Asp Gln Ser Ala Val Ala Phe Gly Gly Glu
                  325                     330                     335
```

26

```
Asn Phe Val Ala Thr Phe Arg Glu Ala Met Asp Asp Asp Phe Asn Thr
          340                 345                 350

Pro Asn Ala Leu Ser Val Leu Phe Glu Met Ala Arg Glu Ile Asn Lys
          355                 360                 365

Leu Lys Thr Glu Asp Val Glu Lys Ala Asn Gly Leu Ala Ala Arg Leu
    370                 375                 380

Arg Glu Leu Gly Ala Ile Leu Gly Leu Leu Gln Gln Glu Pro Glu Lys
385                 390                 395                 400

Phe Leu Gln Ala Gly Ser Asn Asp Asp Glu Val Ala Lys Ile Glu Ala
              405                 410                 415

Leu Ile Lys Gln Arg Asn Glu Ala Arg Thr Ala Lys Asp Trp Ser Ala
          420                 425                 430

Ala Asp Ser Ala Arg Asn Glu Leu Thr Ala Met Gly Ile Val Leu Glu
          435   .     .     440           .     445

Asp Gly Pro Asn Gly Thr Thr Trp Arg Lys Gln
    450                 455
```

```
Met Leu Lys Ile Phe Asn Thr Leu Thr Arg Gln Lys Glu Glu Phe Lys
  1               5                 10                  15

Pro Ile His Ala Gly Glu Val Gly Met Tyr Val Cys Gly Ile Thr Val
          20                  25                  30

Tyr Asp Leu Cys His Ile Gly His Gly Arg Thr Phe Val Ala Phe Asp
          35                  40                  45

Val Val Ala Arg Tyr Leu Arg Phe Leu Gly Tyr Lys Leu Lys Tyr Val
    50                  55                  60

Arg Asn Ile Thr Asp Ile Asp Asp Lys Ile Ile Lys Arg Ala Asn Glu
65                  70                  75                  80

Asn Gly Glu Ser Phe Val Ala Met Val Asp Arg Met Ile Ala Glu Met
              85                  90                  95

His Lys Asp Phe Asp Ala Leu Asn Ile Leu Arg Pro Asp Met Glu Pro
          100                 105                 110

Arg Ala Thr His His Ile Ala Glu Ile Ile Glu Leu Thr Glu Gln Leu
          115                 120                 125

Ile Ala Lys Gly His Ala Tyr Val Ala Asp Asn Gly Asp Val Met Phe
    130                 135                 140

Asp Val Pro Thr Asp Pro Thr Tyr Gly Val Leu Ser Arg Gln Asp Leu
145                 150                 155                 160
```

27

Asp Gln Leu Gln Ala Gly Ala Arg Val Asp Val Val Asp Asp Lys Arg
165 170 175

Asn Pro Met Asp Phe Val Leu Trp Lys Met Ser Lys Glu Gly Glu Pro
180 185 190

Ser Trp Pro Ser Pro Trp Gly Ala Gly Arg Pro Gly Trp His Ile Glu
195 200 205

Cys Ser Ala Met Asn Cys Lys Gln Leu Gly Asn His Phe Asp Ile His
210 215 220

Gly Gly Gly Ser Asp Leu Met Phe Pro His His Glu Asn Glu Ile Ala
225 230 235 240

Gln Ser Thr Cys Ala His Asp Gly Gln Tyr Val Asn Tyr Trp Met His
245 250 255

Ser Gly Met Val Met Val Asp Arg Gln Lys Met Ser Lys Ser Leu Gly
260 265 270

Asn Phe Phe Thr Val Arg Asp Val Leu Lys Tyr Tyr Asp Ala Glu Thr
275 280 285

Val Arg Tyr Phe Leu Met Ser Gly His Tyr Arg Ser Gln Leu Asn Tyr
290 295 300

Ser Glu Glu Asn Leu Lys Gln Ala Arg Ala Ala Val Glu Arg Leu Tyr
305 310 315 320

Thr Ala Leu Arg Gly Thr Asp Lys Thr Val Ala Pro Ala Gly Gly Glu
325 330 335

Ala Phe Glu Ala Arg Phe Ile Glu Ala Met Asp Asp Asp Phe Asn Thr
340 345 350

Pro Glu Ala Tyr Ser Val Leu Phe Asp Met Ala Arg Glu Val Asn Arg
355 360 365

Leu Lys Ala Glu Asp Met Ala Ala Asn Ala Met Ala Ser His Leu
370 375 380

Arg Lys Leu Ser Ala Val Leu Gly Leu Leu Glu Gln Glu Pro Glu Ala
385 390 395 400

Phe Leu Gln Ser Gly Ala Gln Ala Asp Asp Ser Glu Val Ala Glu Ile
405 410 415

Glu Ala Leu Ile Gln Gln Arg Leu Asp Ala Arg Lys Ala Lys Asp Trp
420 425 430

Ala Ala Ala Asp Ala Ala Arg Asp Arg Leu Asn Glu Met Gly Ile Val
435 440 445

Leu Glu Asp Gly Pro Gln Gly Thr Thr Trp Arg Arg Lys
450 455 460

<210> 28
<211> 377

28

```
<212>   PRT
<213>   Synechocystis sp.

<400>   28
Met Lys Asn Cys Glu Asn Asp His Arg Phe Thr Thr Val Ser Ser Gly
 1               5                   10                  15

Lys Ala Trp Gly Gln Leu His Arg Phe Pro Ser Leu Ile Lys Phe Asn
                20                  25                  30

Phe Ala His Arg Ser Thr Thr Ala Met Asp Lys Pro Arg Ile Leu Ser
            35                  40                  45

Gly Val Gln Pro Thr Gly Asn Leu His Leu Gly Asn Tyr Leu Gly Ala
        50                  55                  60

Ile Arg Ser Trp Val Glu Gln Gln Gln His Tyr Asp Asn Phe Phe Cys
65                  70                  75                  80

Val Val Asp Leu His Ala Ile Thr Val Pro His Asn Pro Gln Thr Leu
              85                  90                  95

Ala Gln Asp Thr Leu Thr Ile Ala Ala Leu Tyr Leu Ala Cys Gly Ile
            100                 105                 110

Asp Leu Gln Tyr Ser Thr Ile Phe Val Gln Ser His Val Ala Ala His
        115                 120                 125

Ser Glu Leu Ala Trp Leu Leu Asn Cys Val Thr Pro Leu Asn Trp Leu
    130                 135                 140

Glu Arg Met Ile Gln Phe Lys Glu Lys Ala Val Lys Gln Gly Glu Asn
145                 150                 155                 160

Val Ser Val Gly Leu Leu Asp Tyr Pro Val Leu Met Ala Ala Asp Ile
                165                 170                 175

Leu Leu Tyr Asp Ala Asp Lys Val Pro Val Gly Glu Asp Gln Lys Gln
            180                 185                 190

His Leu Glu Leu Thr Arg Asp Ile Val Ile Arg Ile Asn Asp Lys Phe
        195                 200                 205

Gly Arg Glu Asp Ala Pro Val Leu Lys Leu Pro Glu Pro Leu Ile Arg
    210                 215                 220

Lys Glu Gly Ala Arg Val Met Ser Leu Ala Asp Gly Thr Lys Lys Met
225                 230                 235                 240

Ser Lys Ser Asp Glu Ser Glu Leu Ser Arg Ile Asn Leu Leu Asp Pro
                245                 250                 255

Pro Glu Met Ile Lys Lys Lys Val Lys Lys Cys Lys Thr Asp Pro Gln
            260                 265                 270

Arg Gly Leu Trp Phe Asp Asp Pro Glu Arg Pro Glu Cys His Asn Leu
        275                 280                 285

Leu Thr Leu Tyr Thr Leu Leu Ser Asn Gln Thr Lys Glu Ala Val Ala
    290                 295                 300
```

Gln Glu Cys Ala Glu Met Gly Trp Gly Gln Phe Lys Pro Leu Leu Thr
305   310   315   320

Glu Thr Ala Ile Ala Ala Leu Glu Pro Ile Gln Ala Lys Tyr Ala Glu
              325   330   335

Ile Leu Ala Asp Arg Gly Glu Leu Asp Arg Ile Ile Gln Ala Gly Asn
              340   345   350

Ala Lys Ala Ser Gln Thr Ala Gln Gln Thr Leu Ala Arg Val Arg Asp
         355   360   365

Ala Leu Gly Phe Leu Ala Pro Pro Tyr
    370   375

<210> 29
<211> 419
<212> PRT
<213> Bacillus caldotenax

<400> 29
Met Asp Leu Leu Ala Glu Leu Gln Trp Arg Gly Leu Val Asn Gln Thr
  1   5   10   15

Thr Asp Glu Asp Gly Leu Arg Lys Leu Leu Asn Glu Glu Arg Val Thr
              20   25   30

Leu Tyr Cys Gly Phe Asp Pro Thr Ala Asp Ser Leu His Ile Gly Asn
         35   40   45

Leu Ala Ala Ile Leu Thr Leu Arg Arg Phe Gln Gln Ala Gly His Arg
    50   55   60

Pro Ile Ala Leu Val Gly Gly Ala Thr Gly Leu Ile Gly Asp Pro Ser
 65   70   75   80

Gly Lys Lys Ser Glu Arg Thr Leu Asn Ala Lys Glu Thr Val Glu Ala
              85   90   95

Trp Ser Ala Arg Ile Lys Glu Gln Leu Gly Arg Phe Leu Asp Phe Glu
         100   105   110

Ala Asp Gly Asn Pro Ala Lys Ile Lys Asn Asn Tyr Asp Trp Ile Gly
         115   120   125

Pro Leu Asp Val Ile Thr Phe Leu Arg Asp Val Gly Lys His Phe Ser
    130   135   140

Val Asn Tyr Met Met Ala Lys Glu Ser Val Gln Ser Arg Ile Glu Thr
145   150   155   160

Gly Ile Ser Phe Thr Glu Phe Ser Tyr Met Met Leu Gln Ala Tyr Asp
              165   170   175

Phe Leu Arg Leu Tyr Glu Thr Glu Gly Cys Arg Leu Gln Ile Gly Gly
         180   185   190

Ser Asp Gln Trp Gly Asn Ile Thr Ala Gly Leu Glu Leu Ile Arg Lys
    195   200   205

```
Thr Lys Gly Glu Ala Arg Ala Phe Gly Leu Thr Ile Pro Leu Val Thr
    210                 215                 220

Lys Ala Asp Gly Thr Lys Phe Gly Lys Thr Glu Ser Gly Thr Ile Trp
225                 230                 235                 240

Leu Asp Lys Glu Lys Thr Ser Pro Tyr Glu Phe Tyr Gln Phe Trp Ile
                245                 250                 255

Asn Thr Asp Asp Arg Asp Val Ile Arg Tyr Leu Lys Tyr Phe Thr Phe
            260                 265                 270

Leu Ser Lys Glu Glu Ile Glu Ala Leu Glu Gln Glu Leu Arg Glu Ala
        275                 280                 285

Pro Glu Lys Arg Ala Ala Gln Lys Ala Leu Ala Glu Glu Val Thr Lys
    290                 295                 300

Leu Val His Gly Glu Glu Ala Leu Arg Gln Ala Ile Arg Ile Ser Glu
305             310                 315                 320

Ala Leu Phe Ser Gly Asp Ile Ala Asn Leu Thr Ala Ala Glu Ile Glu
                325                 330                 335

Gln Gly Phe Lys Asp Val Pro Ser Phe Val His Glu Gly Gly Asp Val
            340                 345                 350

Pro Leu Val Glu Leu Leu Val Ser Ala Gly Ile Ser Pro Ser Lys Arg
        355                 360                 365

Gln Ala Arg Glu Asp Ile Gln Asn Gly Ala Ile Tyr Val Asn Gly Glu
    370                 375                 380

Arg Leu Gln Asp Val Gly Ala Ile Leu Thr Ala Glu His Arg Leu Glu
385                 390                 395                 400

Gly Arg Phe Thr Val Ile Arg Arg Gly Lys Lys Lys Tyr Tyr Leu Ile
            405                 410                 415

Arg Tyr Ala
```